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APR 23 2008

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

James Bearzi
Chief
Hazardous Waste Bureau
New Mexico Environment Department
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Santa Fe, NM 87505



Dear Mr. Bearzi:

On behalf of Sandia Corporation (Sandia) and the Department of Energy (DOE), DOE is submitting the Summary Report for Mixed Waste Landfill Monitoring Well Plug and Abandonment and Installation: Decommissioning of Groundwater Monitoring Well MWL-BW1 and Installation of Groundwater Monitoring Well MWL-BW2.

If you have any questions regarding this report, please contact me at (505) 845-6036, or Dan Pellegrino of my staff at (505) 845-5398.

Sincerely,

Kimberly A Davis
for
Patty Wagner
Manager

Enclosure

cc w/enclosure:

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T. Skibitski, NMED-OB
B. Birch, NMED-OB

APR 23 2008

James Bearzi

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cc w/o enclosure:

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CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS

Document title: Summary Report for Mixed Waste Landfill Monitoring Well Plug and Abandonment and Installation: Decommissioning of Groundwater Monitoring Well MWL-BW1 and Installation of Groundwater Monitoring Well MWL-BW2

Document author: Stacy Griffith, Department 06765

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature: _____

Francis B. Mimick
Deputy to the
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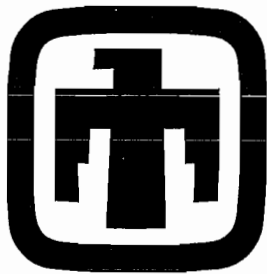
4/11/08
Date

and

Signature: _____

Patty Wagner
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator

4/23/08
Date



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**SUMMARY REPORT FOR MIXED WASTE LANDFILL
MONITORING WELL PLUG AND ABANDONMENT AND INSTALLATION
Decommissioning of
Groundwater Monitoring Well MWL-BW1
Installation of
Groundwater Monitoring Well MWL-BW2**

April 2008

Environmental
Restoration
Project



United States Department of Energy
Albuquerque Operations Office

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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ACRONYMS AND ABBREVIATIONS

AOP	administrative operating procedure
ARCH	air rotary casing hammer
bgs	below ground surface
cm	centimeter(s)
°C	degrees Celsius
DOE	U.S. Department of Energy
ER	Environmental Restoration
ft	feet
FOP	field operating procedure
ID	inside diameter
Jet West	Jet West Geophysical Services
μmhos	micromhos
NNSA	National Nuclear Security Administration
NTU	nephelometric turbidity unit
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of State Engineer
NOD	Notice of Deficiency
MWL	Mixed Waste Landfill
OD	outside diameter
pH	potential of hydrogen
P&A	plug and abandon
PVC	polyvinyl chloride
Sandia	Sandia Corporation
SNL/NM	Sandia National Laboratories/New Mexico
TD	total depth
WDC	Water Development Corporation, Incorporated.

1.0 INTRODUCTION

This report documents the activities for the plugging and abandoning (P&A) and the installation of groundwater monitoring wells at the Mixed Waste Land (MWL) at Sandia National Laboratories/New Mexico (SNL/NM). The activities were performed in January through March 2008 by the SNL/NM Environmental Restoration (ER) Project personnel and the drilling contractor Water Development Corporation, Incorporated. (WDC).

1.1 Regulatory Action

On March 23, 2007, the New Mexico Environment Department (NMED) required that the U. S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) and Sandia Corporation (Sandia) replace monitoring well MWL-BW1 (Bearzi March 2007). In April 2007, the NNSA/Sandia submitted a Plug and Abandonment/Replacement Plan for MWL-BW1 (SNL/NM April 2007).

However, in June 2007, the NMED issued a Notice of Disapproval (NOD) regarding this plan (Bearzi June 2007). The NOD listed 13 items that needed to be addressed in a revised plan. In July 2007, NNSA/Sandia submitted the revised *Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan: Decommissioning of Groundwater Monitoring Well MWL-BW1 and Installation of Replacement Groundwater Monitoring Well MWL-BW2* (the Plan) to the NMED (SNL/NM July 2007). The revised plan addressed the issues listed in the NOD. The NMED issued a Notice of Approval on October 10, 2007 (Bearzi October 2007a) followed by a date correction to the Notice of Approval on October 12, 2007 (Bearzi October 2007b).

1.2 Site Description and History

The MWL is an inactive landfill, designated as a Solid Waste Management Unit, at SNL/NM. The SNL facility is owned by the DOE/NNSA. The MWL is located in Technical Area III of SNL/NM which is within the boundaries of the federally-owned Kirtland Air Force Base, south of the city of Albuquerque (Figure 1-1).

The MWL groundwater monitoring well network consists of seven wells completed within interfingering alluvial fan deposits of the Santa Fe Group (Goering et al. 2002). The network (Figure 1-2) included one background well (MWL-BW1), one on-site well (MWL-MW4), and five downgradient or cross-gradient wells (MWL-MW1, MWL-MW2, MWL-MW3, MWL-MW5, and MWL-MW6). All seven wells are constructed of nominal 5-inch, Schedule 80 polyvinyl chloride (PVC) casing. Wells MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3 have screens composed of slotted Type 304 stainless steel. Wells MWL-MW4, MWL-MW5, and MWL-MW6 have screens composed of slotted Schedule 80 PVC.

Groundwater levels have been declining in the regional aquifer and monitoring well MWL-BW1, installed in 1989, was no longer useful for sampling. At the time for annual groundwater sampling (April 2007), there was approximately 1 foot of water within the well screen of MWL-BW1, and the well could not be sampled.

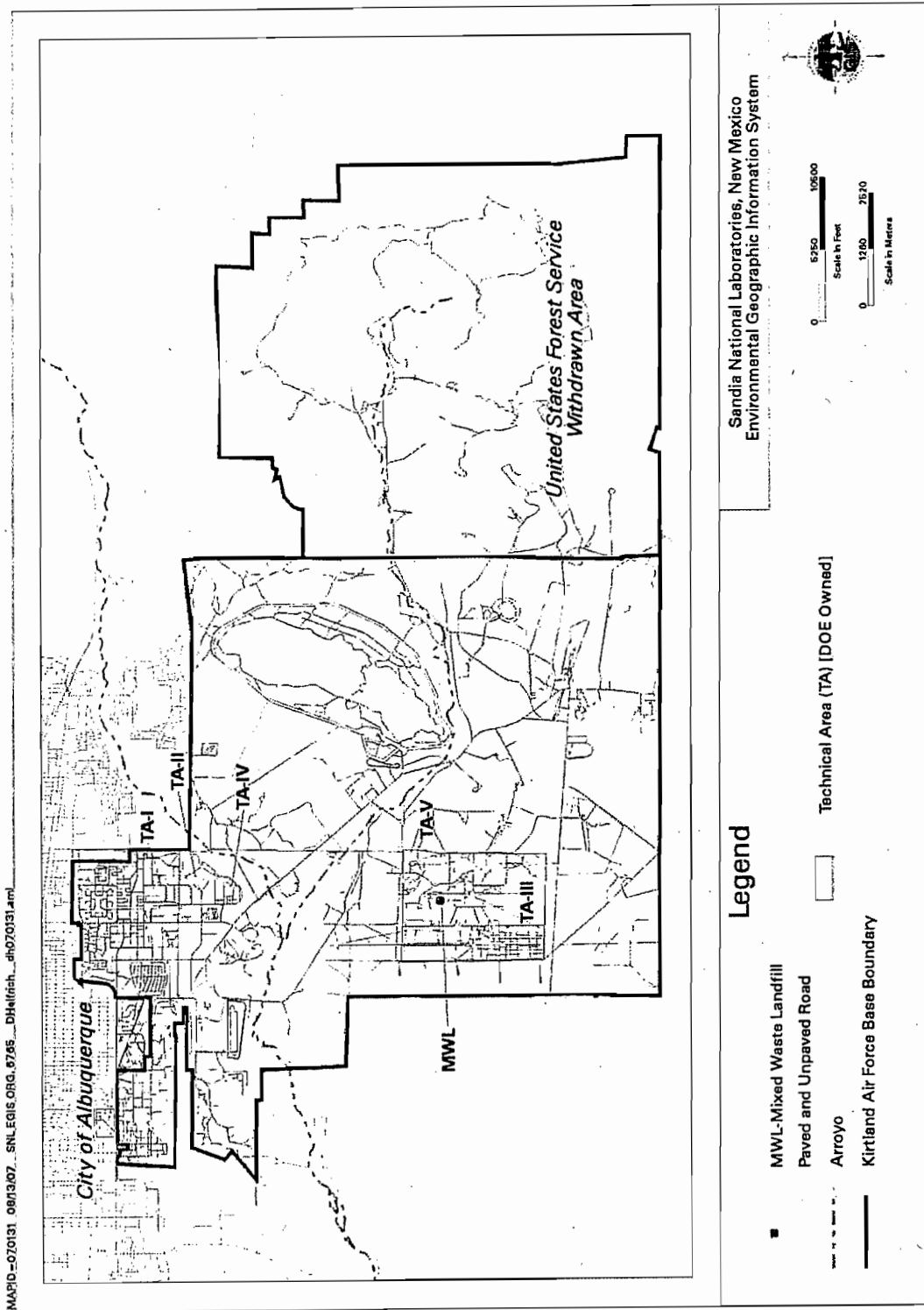
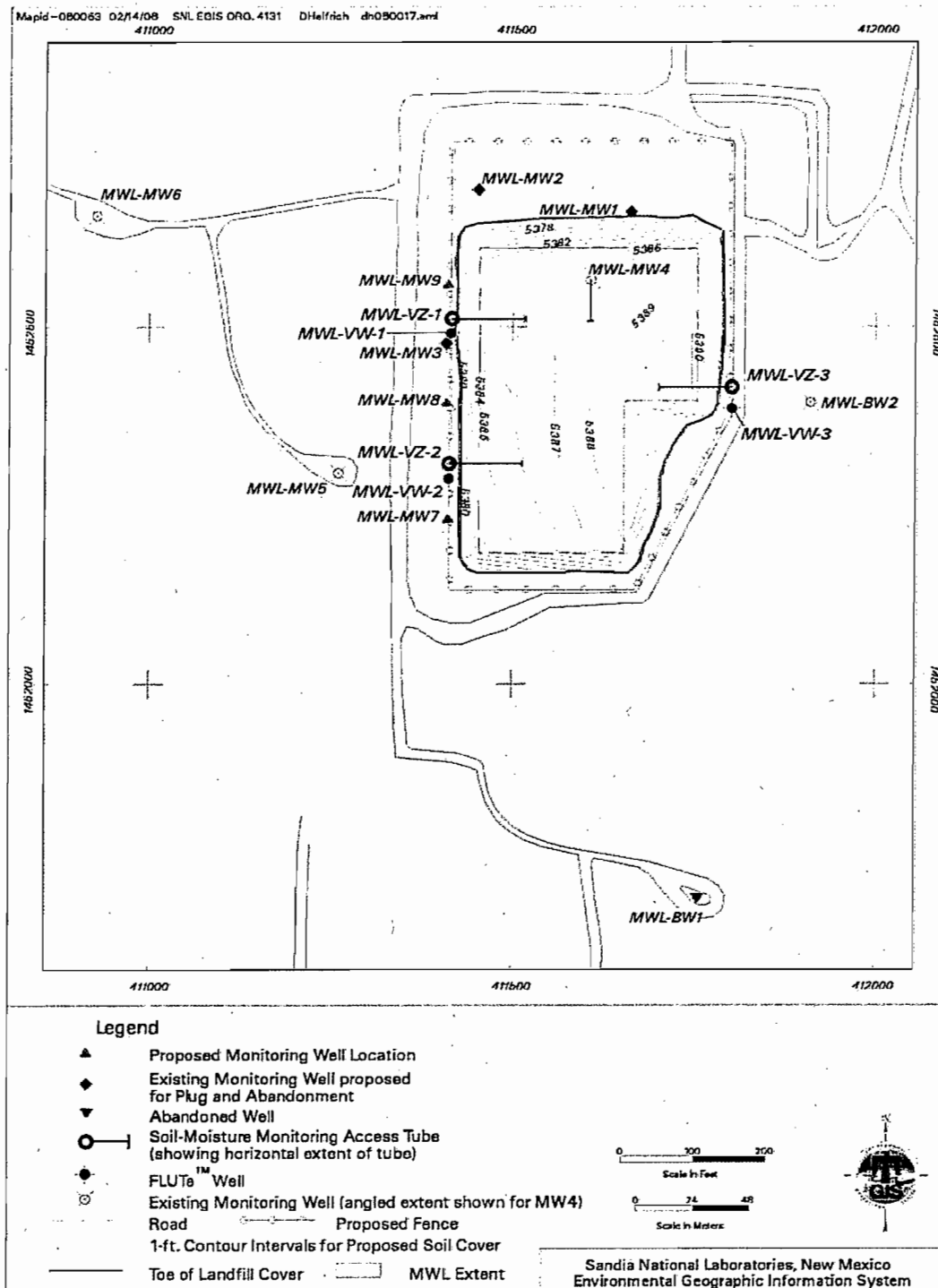


Figure 1-1. Location Map



1.3 Objective

The objective of this project was to successfully P&A MWL-BW1 by grouting the well in situ and to install a new background well, MWL-BW2. This report is organized in chronologic order of activities; the drilling and installation of MWL-BW2, the P&A of MWL-BW1, and the development of MWL-BW2.

The report meets the reporting requirements of the NMED and the New Mexico Office of the State Engineer (NMOSE). The NMED Compliance Order on Consent (the Order) specifies the required elements for reporting on installation of monitoring wells (NMED April 2004) (Attachment A). The NMOSE requirements and guidance can be found in *Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells* (NMOSE August 2005).

2.0 DRILLING AND WELL INSTALLATION

All drilling, well installation, and well development operations were performed by WDC and were supervised by SNL/NM ER Project personnel. Geophysical logging services were performed by Jet West Geophysical Services (Jet West). The borehole for MWL-BW2 was drilled using the air rotary casing hammer (ARCH) method.

The following sections describe the borehole drilling, lithologic and geophysical logging, and well construction. Complete field documentation, field forms, daily driller reports, and lithologic and geophysical logs, are on file at the SNL/NM Customer-Funded Records Center.

2.1 Drilling Operations

The WDC equipment and crew arrived at SNL/NM on January 7, 2008. The drilling equipment (a Speedstar 50K drilling rig and associated equipment) was decontaminated at the ER Project decontamination pad in TA-III prior to the start of drilling operations. Drilling of the borehole for well MWL-BW2, located east of the MWL (Figure 1-2), commenced on January 14, 2008. The first 300 feet (ft) of borehole was advanced with a tricone bit and with 11 3/4-inch outside diameter (OD) drive casing to accommodate drilling through caliche and gravel zones. At 300 ft below ground surface (bgs), the bit and drive casing was switched to 9 5/8-inch OD and the smaller drive casing was telescoped into the borehole. The borehole was initially advanced to a depth of 509 ft. The drilling was suspended at 509 ft bgs to allow for geophysical logging of the borehole (Section 2.3). Following the geophysical logging, the borehole was advanced to a total depth (TD) of 519 ft bgs on January 16, 2008. Field notes are included as Attachment B.

2.2 Lithologic Logging

A lithologic log based on the cuttings returned from the borehole was generated by the ER Project geologist. A combination diagram showing lithologic and geophysical logs, and well construction details is included as Attachment C.

The lithology of the borehole consisted of unconsolidated alluvial and fluvial deposits of the late Pleistocene post-Santa Fe Group alluvium and late Pliocene to Pleistocene upper Santa Fe Group (Goering et al. 2002). The upper Santa Fe Group consists of two first-order sediment types: an alluvial fan sequence derived from uplifts on the basin flanks, and a fluvial sequence derived from the north and deposited by an axial river, the ancestral Rio Grande. The alluvial fan deposits consist of poorly-sorted, weakly-stratified, discontinuous layers of sand with a silt/clay matrix. The lower ancestral Rio Grande sequence was not encountered in this borehole.

From the surface to 80 ft bgs, a sand and gravel mixture of the late Pleistocene post-Santa Fe Group alluvium was encountered. From 80 to 420 ft bgs there was a heterogeneous mixture of silt, sand, and gravel of the upper Santa Fe Group. In general, the sediments were fining downward to 420 ft bgs. A clayey-silt was encountered from 420 to 435 ft bgs. Below that, to the total depth of the borehole (519 ft bgs), there were interfingering units of silty sand with some gravel and silts and clays.

2.3 Downhole Geophysical Logging

On January 15, 2008 the cased borehole was logged with downhole wireline geophysical tools supplied by Jet West to help determine the lithologic characteristics of sediments penetrated in the borehole. Geophysical logs run in the borehole included combination natural gamma ray, thermal neutron, and 1-arm caliper. Although the caliper instrument is located on the same tool, the caliper log is not informative as the logging was completed within the steel drive casing. The geophysical log is provided in Attachment C. The Jet West report and logs are on file in the SNL/NM Customer-Funded Records Center.

The neutron log reveals the telescoped drill casing with a significant signal increase at 300 ft bgs. The gamma ray and neutron readings are attenuated approximately 30 percent by the steel casing and approximately 50-60 percent in dual casing. A notable shift in the neutron signal occurs at 494 ft bgs indicating the level of groundwater in the borehole at the time of the logging. This represents a temporarily depressed water level, due to the drilling activities earlier in the day. The neutron logging continued another 12 ft below the water. The gamma signal is unaffected by the presence of water in the borehole. Due to the position of the gamma detector on the logging tool, the gamma signal ends at approximately 496 ft bgs.

The log indicated that the formation is composed of interbedded clays, silts, and sands. The region of concern, from the groundwater level (approximately 472 ft bgs) downward, was comprised predominately of "dirty" sands with silts and clays (Jet West January 2008). Dirty sand refers to sediment with relatively coarse sand grains mixed with silt and clay that have relatively low hydraulic conductivity and low transmissivity.

2.4 Initial Groundwater Level and Well Construction

On January 15, 2008 the cased borehole had been advanced to 509 ft bgs and initial groundwater was encountered during drilling at approximately 472 ft bgs. During the geophysical logging (occurring later that same day), the groundwater level was at approximately 494 ft bgs within the steel drive casing. The following morning, the groundwater level had risen to approximately 485 ft bgs within the steel drive casing. The water level had not risen to the expected level (472 ft bgs) after allowing the well to recover overnight. The borehole was advanced another 10 ft to approximately 519 ft bgs in an effort to access more transmissive units of sand and/or gravel. It did not appear that any such units were encountered. The sands with silts and clays encountered in the lower portion of the borehole below the static water level are indicative of relatively low-water volume producing units.

Following a telephone consultation with NMED concerning the well construction, it was determined to build the well at the depth proposed in the Plan, assuming the water level would eventually equilibrate to the anticipated level of 472 ft bgs.

Well installation began on January 16, 2008 and was completed on January 18, 2008. The well was constructed of nominal 5-inch diameter (inside diameter of 4.767 inches and OD of 5.563 inches) Schedule 80 PVC flush-threaded blank casing and a 30-foot length of 0.010-inch slot schedule-80 PVC screen. This screen slot size was specified in the Plan to accommodate the low transmissive sand, silts, and clays encountered in the borehole. The sump consisted of a 5-ft length of nominal 5-inch diameter Schedule 80 PVC flush-threaded blank casing with a threaded end cap placed at the bottom. A volclay coarse chip product was used to backfill the

borehole from 510 to 519 ft bgs. Approximately 8 ft of #20-40 sand (Colorado Silica Sand) was used to backfill the borehole from 502 to 510 ft bgs.

The bottom of the well MWL-BW2 was placed at 502 ft bgs and the 30-ft screen section was placed from 467 to 497 ft bgs. The #20-40 sand was used as the primary sand pack in the annulus around the screen and extended approximately 5.5 ft above the top of the screen to 461.5 ft bgs. A secondary sand pack using #60 Colorado Silica sand was placed from 456 to 461.5 ft bgs (the #40-60 sand specified in the Plan is no longer commercially available). A 30-ft volclay coarse chip plug was placed from 426 to 456 ft bgs. The first 18 ft of chips were hydrated and allowed to set overnight. The next day, chips were added up to 426 ft bgs, hydrated, and allowed to set for approximately 2 hours. The Well Construction Diagram is provided in Attachment D.

A bentonite grout (SmoothGrout20™ One Step Grouting System) mixture was used to fill the remainder of the annulus (12 to 426 ft bgs). The first lift of 121 ft of grout was placed and allowed to set for 24 hours. The subsequent lifts of grout were placed in approximately 100-ft lifts and allowed to set for one hour. The final grout lift was brought to 12 ft bgs.

2.5 Wellhead Construction

A 10-ft length of nominal 12-inch diameter steel casing was used as the protective casing at the surface. The casing was placed approximately 7-ft below ground and 3-ft above and was equipped with a hinged locking cap. A fitted locking well cap was also placed on the PVC casing. Concrete was placed in the annulus from the top of the grout at 12 ft bgs to the surface. A 3-ft by 3-ft pad was built around the casing and a brass marker cap was placed in the pad denoting the well name. Three steel guard posts were placed around the pad, and the posts and the protective casing were painted yellow.

3.0 PLUG AND ABANDONMENT

The monitoring well MWL-BW1 was plugged in situ on January 23 and 24, 2008. A Groundwater Well Abandonment Diagram is included as Attachment E. A grout mix (Quick-Grout™) was placed in the well with a portable grout plant (grout was pumped through tubing placed at the bottom of the well and pulled up as well was filled). The well was grouted from 477 ft bgs (bottom of the well) to the surface and allowed to set overnight. The next morning, the grout plug had settled to approximately 12 ft bgs. The concrete pad and steel guard posts were removed from the surface of the well head.

The protective casing consisted of approximately 3 feet of steel casing that was welded to a length of conductor casing that extended below ground. The conductor casing was required for the mud-rotary drilling technique used to advance the borehole and was left in place during the installation of the well to serve as the protective casing. As the annulus between the conductor casing and the PVC well casing was firmly cemented, it was not possible to remove the 20-ft length of conductor casing. There was approximately 14 inches of the casing above ground and the PVC well casing extended a foot above that. The PVC casing was cut flush with the steel casing. A concrete plug was placed from the top of the grout plug (approximately 12 ft bgs) to the top of the two casings (approximately 14 inches above ground). The well monument was built over the two casings and a brass marker was placed in the monument. The marker denotes the well name, date of P&A, and well depth.

4.0 WELL DEVELOPMENT

Well development of MWL-BW2 was conducted March 10 through 13, 2008, according to the Well Development Field Operating Procedure (FOP) 94-41 (SNL/NM 1994). The well was developed with the WDC development rig. The initial water level reading taken on March 10, 2008, was 474.55 ft bgs. The calculated saturated wellbore volume (includes pore spaces in the annular sand pack) was approximately 42 gallons. The volume was originally overestimated (in the field notes – Attachment A) at 68 gallons, as it included the saturated casing and bore volume below the screen section.

The development began by evacuating the well with a stainless steel bailer. Approximately 40 gallons of water was bailed before the well went dry. The water was turbid, but did not contain much sediment. The well screen was swabbed and the well was allowed to recover for approximately 30 minutes. Another 25 gallons of water was bailed before the well went dry again. The following day, the well was repeatedly swabbed, bailed dry, and allowed to recover. A total of approximately 340 gallons (approximately 8 bore volumes) was removed from the well with the bailer.

Water quality parameters were measured and recorded during the well development, including:

- Temperature (degrees Celsius [°C])
- Specific Conductivity (micromhos/centimeter [$\mu\text{mho/cm}$])
- pH (potential of hydrogen), and
- Turbidity (measured in nephelometric turbidity units [NTUs]).

Water quality parameters were not stable during the bailing and swabbing of the well. The well was then purged with a submersible pump (Bennett™) at approximately 1/3 gallon per minute (lowest possible flow rate). The pump was set at the bottom of the screen section (497 ft bgs). Water quality parameters were stable during the pumping of approximately 150 gallons (approximately 3.5 bore volumes). A summary of the water quality parameters measured during pumping are presented in Table 4-1. The Well Development Forms are provided as Attachment F.

Table 4-1. Summary of Water Quality Parameters during Well Development, March 13, 2008

Time	Gallons pumped ^a	Water Level (ft bgs)	Temperature (°C)	Specific Conductivity (µmho/cm)	pH	Turbidity (NTUs)
0802	5	480.18	15.47	693	6.80	0.94
0916	25	482.91	18.37	700	7.22	4.18
1041	50	483.94	18.60	706	7.22	1.00
1213	75	484.21	18.37	706	7.20	0.68
1317 ^b	100	488.10	19.54	703	7.13	2.94
1436	125	485.92	19.36	705	7.17	2.89
1558	150	485.42	19.86	708	7.11	3.39

^a Pumping followed the evacuation of approximately 340 gallons with the bailer on March 10 and 11, 2008. Water quality parameters were not stable during the bailing.

^b Pump rate was increased to approximately ¾ gallon per minute at 1259 and water level dropped significantly. Rate was returned to approximately 1/3 gallon per minute and water level recovered. Turbidity remained below 5 NTUs (as specified in FOP).

ft = Feet

bgs = Below ground surface

°C = Degrees Celsius

FOP = Field operating procedure

µmho/cm = Micromhos/centimeter

NTUs = Nephelometric turbidity units

pH = Potential of hydrogen

5.0 VARIANCES

All FOPs and Administrative Operating Procedures (AOPs) cited in the Plan (SNL/NM August 2007) were followed. There were no instances of variance from either the Plan or the FOPs/AOPs during these activities.

6.0 REFERENCES

Bearzi, J. (New Mexico Environment Department Hazardous Waste Bureau), March 2007. Letter to P. Wagner (U.S. Department of Energy) and F. Nimick (Sandia National Laboratories), "Replacement of Mixed Waste Landfill Groundwater Monitoring Well MWL-BW1, Sandia National Laboratories, EPA ID NM5890110518." March 26, 2007.

Bearzi, J. (New Mexico Environment Department Hazardous Waste Bureau), June 2007. Letter to P. Wagner (U.S. Department of Energy) and F. Nimick (Sandia National Laboratories), RE: Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan, Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, April 9, 2007, Sandia National Laboratories, NM5890110518, HWB-SNL-07-014. June 19, 2007.

Bearzi, J. (New Mexico Environment Department Hazardous Waste Bureau), October 2007a. Letter to P. Wagner (U.S. Department of Energy) and F. Nimick (Sandia National Laboratories), Notice of Approval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan; Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, Revision 1, August 3, 2007, Sandia National Laboratories, NM5890110518, HWB-SNL-07-014. October 10, 2007

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Sandia National Laboratories/New Mexico (SNL/NM), November 1994. "Well Development," FOP 94-41, Revision 0, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), April 2007. "Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan; Decommissioning of Groundwater Monitoring Well MWL-BW1; Installation of Replacement Groundwater Monitoring Well MWL-BW2," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, April 17, 2007.

Sandia National Laboratories/New Mexico (SNL/NM), July 2007. "DOE/SNL Response to NMED's Notice of Disapproval: Monitoring Well Plug and Abandonment Plan and Replacement Well Construction Plan; Decommissioning of Groundwater Monitoring Well MWL-BW1, Installation of Replacement Groundwater Monitoring Well MWL-BW2, April 9 2007; and Revised Plan, July 2007," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

ATTACHMENT A
Well Data for MWL-BW2

Table A-1. Well Data for MWL-BW2

Items Required by the Order ^a Section VIII.D	Comments
1. Well name/number	MWL-BW2
2. Date of well construction	January 22, 2008 (completion)
3. Drilling method	Air rotary casing hammer
4. Drilling contractor and name of driller	Water Development Corporation, Mark Green
5. Borehole diameter and well casing diameter	Borehole: 11 3/4 inches 0 to 300 ft bgs, 9 5/8 inches to 300 to 519 ft bgs Well casing: 5.563 inches OD, 4.767 inches ID
6. Well depth	502 ft bgs (borehole depth 519 ft bgs)
7. Casing length	504.35 ft total (bgs 2.35 ft above ground)
8. Casing materials	Schedule 80 PVC
9. Casing and screen joint type	Flush thread
10. Screened interval(s)	467 to 497 ft bgs
11. Screen materials	Schedule 80 PVC
12. Screen slot size and design	0.010-inch slotted screen
13. Filter pack material and gradation	Primary: #20-40 silica sand Secondary: #60 silica sand
14. Filter pack volume (calculated and actual)	Calculated: 18.2 ft ³ , 36.4 50-lb bags Actual: 40 bags
15. Filter pack placement method	Gravity feed through drive casing
16. Filter pack interval(s)	Primary: 461.5 to 510 ft bgs Secondary: 456 to 461.5 ft bgs
17. Annular sealant composition	Volclay chip plug, bentonite grout
18. Annular sealant placement method	Gravity feed through drive casing
19. Annular sealant volume (calculated and actual)	Calculated: Plug 11.4 ft ³ , 12.7 50-lb bags Grout 1 st 121-ft lift 46 ft ³ , 345 gallons Grout 2 nd through 4 th 100-ft lifts 63 ft ³ , 472 gallons each Actual: Plug 14 bags Grout 1 st 121-ft lift 380 gallons Grout 2 nd through 4 th 100-ft lifts 400 gallons each (brought to 12 ft bgs)
20. Annular sealant interval(s)	Plug: 426 to 456 ft bgs Grout: 12 to 426 ft bgs
21. Surface sealant composition	Concrete
22. Surface seal placement method	Gravity feed through drive casing
23. Surface sealant volume (calculated and actual)	7.56 ft ³ Not recorded, placed concrete 0 to 12 ft bgs
24. Surface sealant interval	0 to 12 ft bgs
25. Surface seal and well apron design and construction	3-ft by 3-ft by approximately 8-inch deep concrete pad
26. Well development procedure and turbidity measurements	Stainless steel bailer and submersible pump (see Table 4-1 for turbidity measurements)
27. Well development purge volume(s) and stabilization parameter measurements	Total of 490 gallons (see Table 4.1 for parameter measurements)
28. Type and design and construction of protective casing	10-ft length of 12-inch diameter steel casing with hinged cap (7 ft bgs and 3 ft above ground)
29. Well cap and lock	Hinged cap on protective casing with padlock and locking well cap with padlock on well casing
30. Ground surface elevation	5386 ft amsl
31. Survey reference point elevation on well casing	5388.35 ft amsl
32. Top of monitoring well casing elevation	5388.35 ft amsl

Refer to footnotes at end of table.

Table A-1. Well Data for MWL-BW2 (concluded)

Items Required by the Order ^a Section VIII.D	Comments
33. Top of protective steel casing elevation	5388.95 ft amsl
34. Name of geologist	Stacy Griffith
35. Initial water level	472.5 ft bgs (estimated by diminished cuttings return during drilling)
36. Final water level	474.46 ft bgs January 22, 2008 (475.27 ft bgs on April 3, 2008)
37. Date of well development	March 13, 2008 (completed)

^a New Mexico Environment Department, April 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act," § 74-4-10, New Mexico Environment Department.

amsl = above mean seal level
 bgs = below ground surface
 ft = feet
 ft³ = cubic feet
 ID = inside diameter
 OD = outside diameter
 PVC = polyvinyl chloride

ATTACHMENT B
Field Notes for Activities at MWL-BW1 and MWL-BW2

170

1-7-08

Drilling @ MWL

Kick-off Meeting w/ training

1344: Arrive ERFO for meeting

Mike Skelly

Stacy Griffith

Mike Sanders

(CT-32165)

SNL/NM (CT-32215)

Clint

Mark Green

Dustin

Richard

Water Development Corp.

Watch all training videos @ ERFO, Discuss SW,
HASP, site access, security, etc.

1530: All personnel leave site.

1-8-08

Drilling @ MWL

Task: Set up @ site

Personnel: SRG - SNL/GRAM

Mark Green

~~29 Clint~~ Dustin Gray } WDC

Richard Bare

0930: Arrive @ site, mob equipment. from decon pad.
All equipment decon'd prior to arriving @ drill
site.

Mike Skelly arrives

1000: Franz Laffer arrives

1045: Craig Hamber arrives to conduct safety
inspection

1115: Safety inspection complete & approval from
Hamber to proceed w/ work.

1130: All personnel off site. WDC needs new filters for
rig. Must go off-site.

Return to ERMO

1-14-08 Monday

Task: MWL Drilling

Weather: Cold, clear. 26°F @ 0700.

Personnel: SRG - SNL/GRAM

Mark Green

Richard Bare

WDC

0645: SRG @ ERMD, mob to site.

0700: On-site all personnel. Conduct daily H&S mtg.

Dustin Crow not on site. New crew member (363-2396) waiting @ bridge office.

Rig Type STAR30K

0736: Setting up @ location.

0750: Bill Gibson & Alfred S. on-site to deliver eye wash station.

0810: Bill & Alfred off-site

Drill string - 1' shoe then 20' of 1 3/4" drill casing
1st length of casing 20'

0830: 2nd 20' → 40' total

0850: 3 x 20' → 60'

0900: 4 x 20' → 80'

0930: 5 x 20' → 100'

no grab sample

0940: 6 x 20' → 120'

0945: 7 x 20' → 140'

145' no grab sample
sample @ 155'

1003: 8 x 20' → 160'

1021: 9 x 20' → 180'

1033: 10 x 20' → 200'

1050: 11 x 20' → 220'

1105: 12 x 20' → 240'

1130: 13 x 20' → 260'

1-14-08 cont

- 1140: 14 x 20' → 280' total drill pipe casing in hole.
1201: 15 x 20' → 300'
1220: Reached 300' bgs w/ 11 $\frac{3}{4}$ " casing. Pull drill stem x1
1230: All personnel off-site for lunch, badge office, decon pad.
1350: All personnel back on-site including Dustin Crow d ERFO (Lynch, Gibson, Santillanes) to set up site perimeter zone.
1435: Set up w/ 9 $\frac{5}{8}$ " drill casing, trip back in all drill stem. 520' of casing in pipe truck.
1500: Site visitors: Casey Heath (WDC, new crew)
Danielle Nieto (SNL), Daniel Kurtz (SNL)
Lynch, Gibson, Santillanes (ERFO) - set up exclusion zone perimeter.
Cover HASP + training forms w/ Heath.
1540: Heath, Nieto, Kurtz → off-site.
1550: Mike Skelly on-site for SSG Griffith. SSG off-site @ 1605.
1629: Gibson/Lynch/Santillanes finish setting up perimeter fence/caution barrier; they leave for ERFO.
1647: Drill rig off, secure site, drill crew off site.
1653: Secure Trailer, Skelly offsite.

Michael F. Skelly

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1-15-08 Tuesday

Task: MWL Drilling

Weather: Cold, clear

Personnel: SRG - SNL/GRAM

Mark Green

Richard Bare

WOC

0645: SRG @ ERMO, mob to site

0700: Personnel on-site. Conduct H+S mty.

0732: Prepare to resume drilling @ 300'. 220' of casing on pipe truck.

0740: casing 1 x 20' → 320' 200'

0802: 2 x 20' → 340' 180'

0818: 3 x 20' → 360' 160'

0840: 4 x 20' → 380' 140'

0902: 5 x 20' → 400' 120'

0917: 6 x 20' → 420' 100'

0930: Casey Heath on-site, Badge # CT42053 Temp

Mark Green CT41780

Richard Bare CT41975

0935: 7 x 20' → 440' 80'

0950: 8 x 20' → 460' 60'

1017: 9 x 20' → 480' 40' expect WT ~ 472'

1050: 10 x 20' → 500' 20' + 10' on truck

1100: Cyclone & tube blocked after encountering material below WT.

1-15-08 cont

1140: Add 10' casing → total 510'

1210: Total Depth ~509'. Added ~100-150 gallons water to clean out. Will evacuate all added water.

1245: Start tripping out drill stem.

1315: All drill stem out of hole.

1330: Drill crew prep well materials. SRG offsite to ERMQ

1400: Skelly, SRG & JetWest Geophysical Services onsite.

Neutron probe & resistivity logging of well w/in drive casing. (JetWest personnel - Al Henderson)

1445: Start logging borehole.

1700: JetWest finished. Skelly offsite.

1720: Secure site. SRG w/ JetWest to Eubank Gate.

~~SRG~~

1-16-08 Wednesday
Task: MWL Drilling

Weather: Very cold, windy.

Personnel: SRG SNL/GRAM

Mark Green

Richard Bare

Casey Heath

> WOC

0645: SRG @ ERMO mob to site.

0700: All personnel on site. Conduct H+S mtg

0740: Water level 485' bgs. (measurement 489' - 3.8' stick up)

WL has not reached anticipated ~472' bgs.

0800: SRG off site to ERMO to discuss situation.

0930: Call Mark Green → trip drill stem back in hole & drill an additional 10'.

1000: SRG on site, drill crew tripping into borehole

1030: Mike Skelly on site. Begin drilling @ 509' gravel layer only few inches thick. Back into some gravel but w/ clay.

1120: Not much difference in lithologies → intermittent sands, clay, very few gravel lenses. TD = 519' bgs.

1145: Trip out drill stem.

1220: All drill stem out

1300: SRG off-site to ERMO.



1-17-08 Thursday

Task: MWL Drilling

Weather: Very, very cold \rightarrow 10°F w/ wind chill

Personnel: SRG / SNL/GRAM

Mark Green

Casey Heath

Richard Bare

> WDC

0630: SRG @ ERMO mob to site.

0655: SRG Green & Heath on site. Very odd conditions. -

0720: Conduct H+S mtgs.

0730: Tag water level. 502.3' - 3.8' stick up = 498.5'

Tag bottom of borehole ~ 523' - 3.8' " = 519'

Borehole stayed open, water level has not come up to expected level (~472')

There is ~20.7' of water in borehole.

Expect ~47' of water in borehole.

0945: Mike Skelly called Will Moats (UMED) to discuss situation. Moats agreed to set the well as proposed w/ an anticipated water level of 472'.

1000: Begin to build well. Brand new tape measure for tag.

1030: Add Volclay coarse chips to bottom of hole.

50 lb bags \rightarrow HHT II

pulled 10' casing left in hole 510'

added plug to 509.2' bags

Build well - 5" cap, 5' sumip, 30' 0.010 slot screen centralizer @ base of screen & at top

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1-17-08 crA

1400 Set well → 504.66' of PVC set bottom
@ 502' add 5' of stick up for building well
(7.66' of stick up w/ addition)

1420: Start adding 20-40 sand 50 lb bags HHT HHT
bringing sand up to 462' (need ~37 bags 20-40 sand)
Clint on-site to deliver more 20-40 sand

1440: Pull casing 1 x 10' → 500' in hole
adding 20-40 sand 9 HHT HHT

1500: pull casing 1 x 10' → 480' in hole
add sand @ ~489' HHT HHT

1515: pull 1 x 20' 460' in hole
add sand to ~469' HHT HHT

1530: pull 1 x 10' 470'
tag sand @ 460', swab the well to
settle sand around screen. Used 40 bags 20-40 sand

1600: pull 1 x 10' casing 460'
tag sand @ 461.5', add 60 sand
(40-60 sand is no longer available)
100 lb bags → II (2 total)

tag top of 60 sand @ 456'
pull 1 x 20' casing (440' in hole)

1630: Adding volclay chips 50 lb. bags HHT II (calc. 9, use 7)
pull 1 x 10' casing (430' in hole)
chips @ 438' will hydrate let sit overnight

1715: add ~100 gallons water

1730: Secure site. SRC to ERMO

[Signature]

1-18-08 Friday

Task: MWL Drilling

Weather: Cold & clear

Personnel: SRG SNL/GRAM

Mark Green

Richard Bare > WDC

Casey Heath

0700: SRG @ ERMO, mob to site

0750: All personnel @ site. Conduct H & S mtgs.

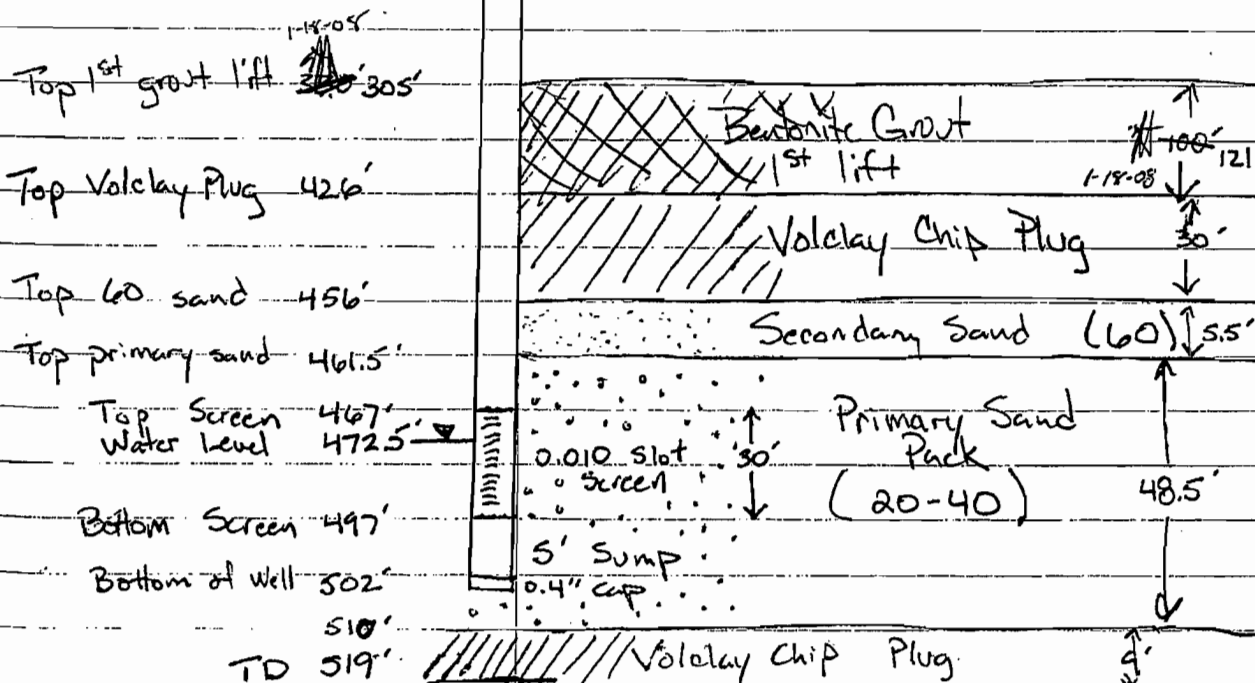
0754: Adding Volclay chips to 426' need 4 → 1111⁽⁴⁾ used

0820: Water level 472.5' → Yeah.

0830: Hydrate last 10' of chips w/ 140 gallons

0850: Pull 1x20' casing (410' in hole)

Well Construction Diagram



1-18-08 cont

0900: Mark Green offsite to Home Depot

Richard + Casey to decon pad w/ casing

0930: Richard + Casey break.

0945: Mark back onsite. Prepare to mix 1st lift of grout.

1020: Pump in 1st tank of ^{~350 gallons} grout. Smooth Grout One Step Grouting System (powdered) 50 lb. bags Wyoming Bentonite

1030: Pull 4 x 20' casing (330' casing in boreholes)

1045: Cut off upper portion of well casing.

Pull 5 x 20' casing (230' casing)

1105: Pull all remaining 9^{5/8}" casing. Leave in 11^{3/4}" (300' in borehole).

1205: All 9^{5/8}" casing pulled. ~5' open hole b/w bottom of 11^{3/4}" casing @ 300' & top of grout ~305' WDC crew to decon pad to clean drill casing. Will go to standby later this afternoon.

1300: Secure site. SRG to ERMB.

1-21-08 Monday

Task: MWL Drilling

Weather: Cold clear high winds expected

Personnel: SRG SNL/GRAM

Mark Green

Richard Bare > WDC

0645: SRG @ ERMD, mob. to site

0700: All personnel on site. Casey Heath not on site today.

0720: Water level @ 474.32. No grout on water level probe. Conduct H&S mtgs.

0751: Tagged top of grout @ 308'.

0900: Mixed batch of grout ~400 gallons. ^{~100'} Pumped in.

Pull 20' casing → Ht = 100'

0950: Mix ~400 gallons grout ~100', pump in.

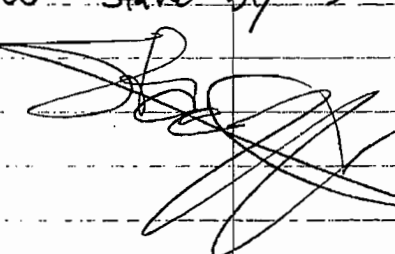
1000: Pull 100' casing. let grout sit 1 hour.

1200: Mix last batch of grout to bring up to near surface

1236: Grout up to ~12' bgs. Let set up + top off tomorrow. SRG off-site to ERMD.

WDC site clean up + decom.

1300-1700 - Stand by → 4 hours



1-22-08 Tues

Task: MWL Drilling - Official date of Completion BW2

Weather: Overcast, cold

Personnel: SRG SNL/GRAM

0800: SRG on-site.

Mark Green & Richard Bare (WDC) on site.

Prepare to complete well pad @ BW2.

Casey Heath on site (WDC).

0858: Water level 474.46'

1000: WDC crew to finish well pad w/ bollards.

SRG back to ERMO.

Casey Heath picked up new badge CT42669

10:30 - 5:30 Stand by hours - 7hr.



1-23-08 Wed

Task: P+A @ MWL-BWZ

Weather: Clear, cold

Personnel: SRG SNL/GRAM

Mark Green

Richard Bare

Casey Heath

> WDC

0800: Mob to BW1 to prepare to P+A the well.

0830: Run tubing to bottom of well for grouting. Conduct H/S wdg.
Grout product: Quick-Grout™ Baroid

Placement of grout w/ portable grout plant
on trailer. Mixes grout & water in small tank
& pumps into well from bottom up w/
flexible hose.

1030: Start grouting well.

1245: Grout to surface. All personnel off-site. WDC crew
to decor grout equipment. Will check grout level
in morning. SRG to ERMO.
5 hours standby

1-24-08 Thur

Task: MWL Drilling - Pt A MWL-BW1

Weather: Overcast, cold

Personnel: SRG SNL/GRAM

Mark Green

Richard Bove

Casey Heath

> WDC

0645: SRG @ ERMO, mob to site.

0700: SRG on site trailer. H&S mtg.

0740: David Miller and Mike Sanders on site
for discussion of TA-V next week.

0830: Miller & Sanders off site.

0900: Grout sunk to 12' bgs in well casing @ BW1.
Use forklift to pull up concrete pad & bollards.

The protective casing (above pad portion)
was welded to conductor casing. This was
not indicated on the well construction diagram.

The lithology log show 14" butt welded
casing to 20' bgs. There is ~10" of the
casing above ground & another 1' of the
PVC well casing above that. Cannot pull

~~that~~ that 20' steel casing. In order to abandon
the well, cut off the PVC level w/ the
steel casing. Fill to surface w/ quickcrete
& mound around steel casing. Place tagger in
concrete monument to be marked as Pt A
by ERFO later.

1130: All personnel off site to 6585 to watch
TA-V security video.

MWL-BW2 DEVELOPMENT 3/10/08 MON
 PERSONNEL: MIKE SANDERS (6765/GRAM INC.),

NICHOLAS (NICK) COOPER (WOC)

WEATHER: CLEAR, CALM, MID-50S

TASK: START MWL-BW2 WELL DEVELOPMENT.

0800 ARRIVE C BARGE OFFICE (IPSC BLDG).

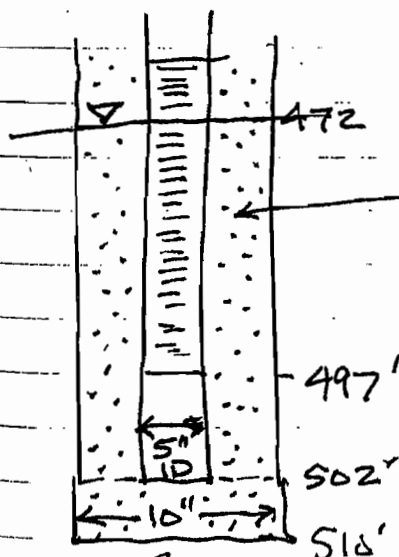
COOPER HAS TEMP. BADGE. HEAD TO B.

9925 FOR VIDEO ~~TRAINING~~ ^{WHS} TRAINING.

1054 ARRIVED @ TA-IE DECON PAD AFTER COMPLETING
 VIDEO TRAINING + FILLING TO GAL WATER
 TANK # B. 9925.

1346 STILL @ DECON PAD. HAD TO RUN DOWN REPAIR
 PART FOR STEAM CLEANER.

BORE VOL CALCS: Please see recalculation p. 188
 3-11-08



GRAVEL PACK:

10" DIAM: $0.5454 \text{ FT}^3/\text{FT}$

5" DIAM: $0.1364 \text{ FT}^3/\text{FT}$ (472' - 502')

NET: $0.5454 - 0.1364 = 0.409 \text{ FT}^3/\text{FT}$

502' - 510': $0.5454 \times 8' = 4.4 \text{ FT}^3$

$\rightarrow 0.409 \times 30' (472' - 502') = 12.3 \text{ FT}^3$

SUM VOL IN GRAVEL PACK FROM 472' - 510':

$12.3 + 4.4 = 16.7 \text{ FT}^3 \times 7.48 \text{ GALS/FT}^3$

$\times 30\% \text{ POROSITY} = 37.5 \text{ GALS}$

CASING (5" ID): $1.62 \text{ GALS/FT} \times 30' = 30.6 \text{ GALS}$

TOTAL: $37.5 + 30.6 = 68.1 \text{ GALS PER BORE VOL}$

Mike Sanders
 3/10/08

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MWL-BW2 DEVELOPMENT

3/10/08, MON

1407 HEAD TO BW2, DECON DONE. ONLY GEN.

2-3 GALS WATER TO DECON PAD.

(TO TOP OF STEVE PIPEL PROT. CASING)

1435 477.55' ~ 3.0' STICKUP ABOVE GROUND SURFACE.

474.55' TO WATER BGS. ~ 7.5' OF SCREEN IS DRY.

1440 COMPLETED HASP REVIEW, TAILGATE HARBOR

DISCUSSED LAYNE LIFTING HOOK ACCIDENT ~

2 YRS AGO.

1520 BAILED ~ 40 GALS FROM WELL - MUDDY WATER,

NOT MUCH SEDIMENT IN SUMP. BAILED DRY.

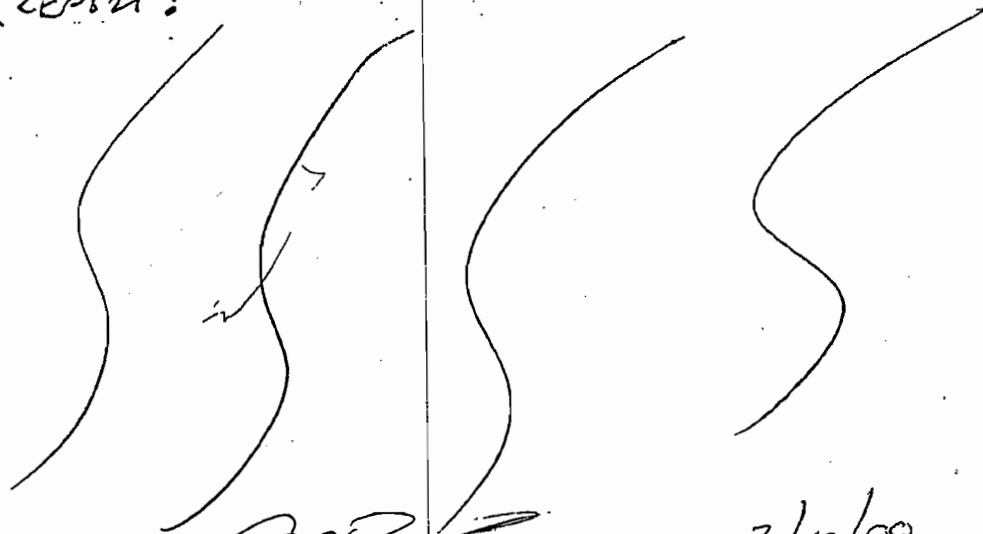
1542 START SWABBING WELL

1625 FINISH SWABBING, RUN BAILER AGAIN.

1700 BAILED ~ 25 GALLONS (~ 75 TOTAL NOW), WATER
LEVEL DROPPING FAIRLY QUICKLY (LOW PRODUCER).

LOCK UP WELL, WILL SWAB AGAIN IN AM.

1718 DEPART SITE, GIVE SALLY GRIFFITH STATUS
REPORT.



MR. EMMER 3/10/08

MWL-BWZ Development

11 MAR 08 Tues.

Michael Shelly taking over for Michael Sanders.

0648 at ER MO + pick up gear + truck head
to MWL

0703 Onsite at MWL-BWZ

0711 Nick Cooper onsite, set up over well,
discuss daily plan, review tailgate H&S plan.0732 Tag Water level 478.1 top of protective
casing (store pipe).

0758 Begin swabbing well screen

0802 Finish swabbing, run bailer.

0815 Removed ~95 gal (total; 45 today) water
sample very muddy/silty (see field log
for parameter readings).0832 Bailed dry at ~120 gal (total) allow well
to recover

0848 Resume bailing.

0904 Bailed dry at ~140 gal (total) allow well to recover

0921 Resume bailing, transfer water to drum #3 (1506).

0947 Bailed dry at ~160 gal.

1010 Resume bailing.

1021 Bailed dry at ~175 gal

1044 Resume bailing

1055 Bailed dry at ~185 gal

1126 Resume bailing

1138 Bailed dry at ~200 gal, allow well to set before
swabbing. leave site for ER MOS.

1156 at ER MOS tag off with Stacy.

3-11-08 cont

1250: S. Griffith on site.

WDC swabbing well again.

1300: Bailed ~ 25 gal, well nearly dry, allow recovery

1340: Resume bailing. Bailed ~ 20 gal → dry

1430: " "

1455: ~ 250 gallons total purged from well

parameters not stable, see log

1500: Able to purge ~ 20 gal every 20-25 minutes

1530: Mike Skelly on-site. Continue purge & recovery

1700: Total purge volume @ ~~300~~³⁴⁰ gal, parameters

did not stabilize w/ bailing method

alone. Well recovery too slow to pump w/

WDC development rig. Will continue to

develop w/ ERFO. Skelly offsite.

1715: Secure site. WDC & Griffith offsite

Recalculation of Well Bore Volume:

$$R_1 = \text{well ID} = 0.40 \text{ ft}$$

$$R_2 = \text{bore ID} = 0.83 \text{ ft}$$

$$\text{saturated screen height } (497 - 474.55) = 22.45 \text{ ft}$$

$$V_1 = \text{saturated casing volume} = \left(\frac{R_1}{2}\right)^2 \pi (22.45) (7.48 \text{ gal/ft}^3) = 21 \text{ gal}$$

$$V_2 = \text{saturated bore volume} = \left(\frac{R_2}{2}\right)^2 \pi (22.45) (7.48) = 91 \text{ gal}$$

$$V_3 = \text{sand pack} = (V_2 - V_1) (0.30) = 21 \text{ gal}$$

$$\text{Well Bore Volume} = V_3 + V_1 = 42 \text{ gal}$$



3-13-08

Task: Continued Development MWL-BWZWeather: Clear, expected very high windsPersonnel: S. Griffith / GRAM

Robert Lynch

Bill Gibson

Alfred Santillanes

ERFO

0730: Prepare to pump well w/ Bennett pump

Water level 477.35' BTC

Set pump @ bottom of screen section ~497'

0802: Set pump @ bottom of screen.

Start pumping @ ~ 1/3 gal/minute.

Parameters recorded on log.

Water is only slightly cloudy.

0830: After 10 gals → turbidity 1.28 NTU

0900: 20 gals → " 6.34 NTU

Water level drops to 483 and
then only drops slightly w/ continued
pumping.

1116: WL 483.73' BTC, turb 1.01 NTU

60 gals purged

3-13-08 cont

1300: Pump rate @ $\sim \frac{1}{2}$ gal/minute.

WL in well ~ 483

Parameters remain stable.

Turbidity below 1 NTU.

Increase pump flow rate to approximately $\frac{3}{4}$ gal/min.

WL drops ~ 4 ft & turb increases. (max 25.2 NTU)

1330: Reduce flow rate to $\sim \frac{1}{3}$ gal/min.

Parameters stabilize turb returns to < 1 NTU

1400: Continue pumping @ lower rate.

Total gallons pumped 115.

1558:

Total gallons @ 150 for day. Gallons bailed previously this week ~ 340 gallons.

Parameters stabilized. End of development

Pull pump, secure well head, leave site.

See field logs for MWL-BWd.

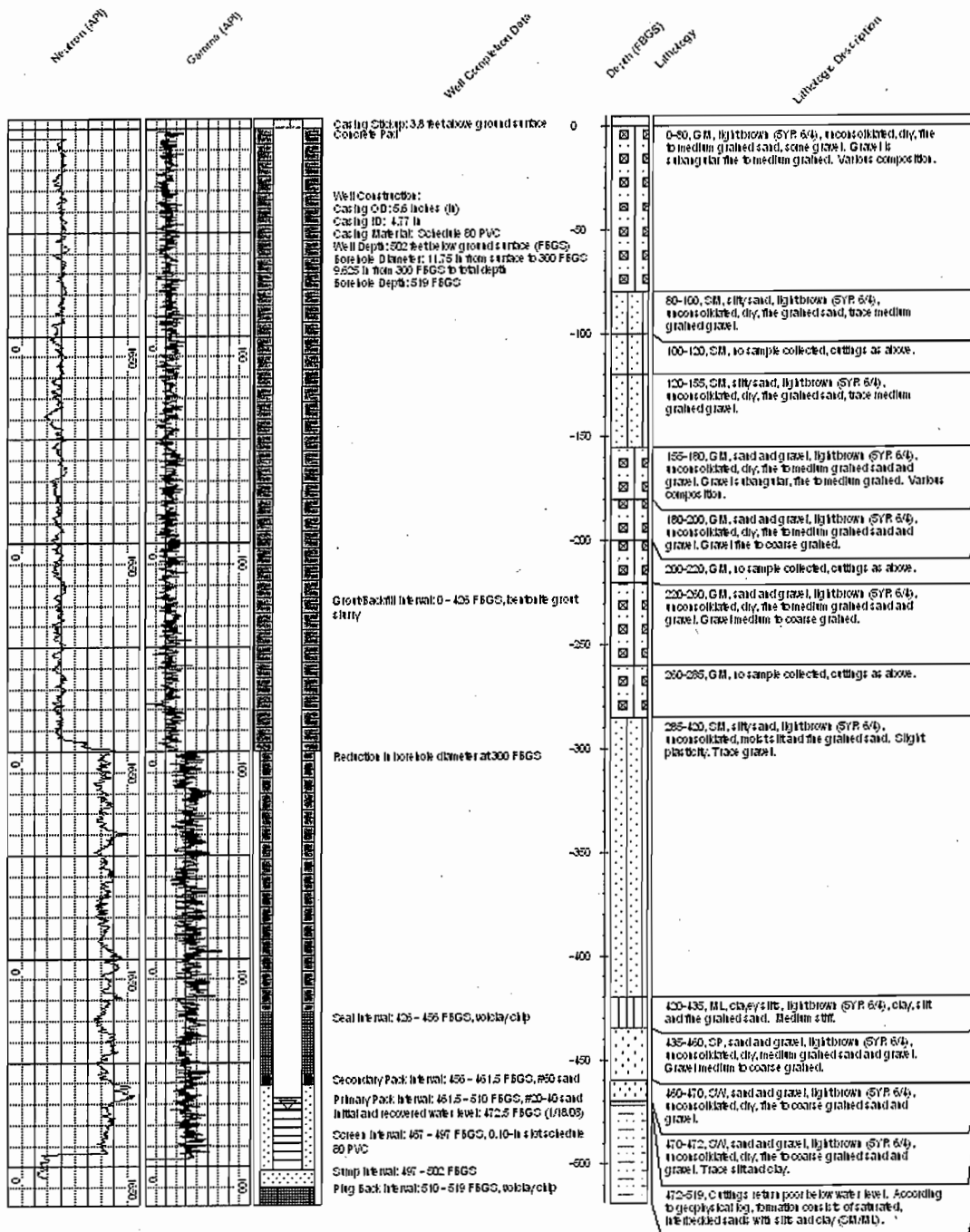
Stacy

ATTACHMENT C

Combination Lithologic and Geophysical Logs with Well Construction Details for MWL-BW2

Sandia National Laboratories/New Mexico
Environmental Restoration Department
MWL-BW2

Geologist: Stacy Griffith
Drilling Date: January 14-15, 2008
Well Installation Date: January 22, 2008



Water level during geophysical logging (~494 FSGS) was not static.

ATTACHMENT D
Well Construction Diagram for MWL-BW2

WELL DATABASE SUMMARY SHEET

Project Name: ENVIRONMENTAL RESTOR	Geo Location: TA-III	
ER ADS #: 1289	Well Completion Date: 22-JAN-2008	
Well Name: MWL-BW2	Completion Zone: ALLUVIAL MATERIAL	
Owner Name: U.S. DEPT. OF ENERGY	Formation of Completion: SANTA FE GROUP	
Date Drilling Started: 14-JAN-2008	Well Comment: INITIAL WATER LEVEL APPROX. BASED ON CONDITIONS ENCOUNTERED DURING DRILLING. CUTTINGS RETURN DIMINISHED DUE TO SATURATION.	
Drilling Contractor: WATER DEVELOPMENT CORP.		
Drilling Method: AIR ROTARY CASING HAMMER		
Borehole Depth: 519	BOREHOLE DIAMETER IS 11 3/4 IN. TO 300 FT. AND 9 5/8 IN. TO TD.	
Casing Depth: 502		

Survey Data		Completion Data Measured Depths (FBGS)
Survey Date: 23-MAR-2008		
Surveyed By: SNL/NM		
<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> State Plane Coordinates (X) Easting: 411947.89 (Y) Northing: 1452389.85 </div>		
<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Surveyed Elevations (FAMSL) </div>		
Protective Casing: 5388.95		Casing Stickup: 2.34
Top of Inner Well Casing: 5388.35		Interval Start Stop
Concrete Pad: 5386.01		BOREHOLE 0' 300'
Ground Surface: 5386		I.D. 11.75"
		Interval Start Stop
		GROUT/BACKFILL 0' 426'
		BENTONITE GROUT
		Interval Start Stop
		CASING 0' 502'
		SCHEDULE 80 PVC I.D. 4.767" O.D. 5.563"
		Slot Size 5.56"
		Interval Start Stop
		BOREHOLE 300' 519'
		I.D. 9.625"
		Interval Start Stop
		SEAL 426' 456'
		VOLCLAY CHIP
		Interval Start Stop
		SECONDARY PACK 456' 461.5'
		#60 SAND
		Interval Start Stop
		PRIMARY PACK 461.5' 510'
		#20-40 SAND
		Interval Start Stop
		SCREEN 467' 497'
		SCHEDULE 80 PVC
		Slot Size .01"
		Interval Start Stop
		SUMP 497' 502'



Calculated Depths and Elevations

Initial Water Elevation: 4915.85
(FAMSL)

Initial Depth To Water: 472.5
(FBGS)

Last measured water level was 4913.5 FASL
measured on 22-JAN-2008

Date Updated: 03-APR-08 Date Printed: 07-APR-2008

WELL DATABASE SUMMARY SHEET

Project Name:	ENVIRONMENTAL RESTOR	Geo Location:	TA-III
ER ADS #:	1289	Well Completion Date:	22-JAN-2008
Well Name:	MWL-BW2	Completion Zone:	ALLUVIAL MATERIAL
Owner Name:	U.S. DEPT. OF ENERGY	Formation of Completion:	SANTA FE GROUP
Date Drilling Started:	14-JAN-2008	Well Comment:	INITIAL WATER LEVEL APPROX BASED ON CONDITIONS ENCOUNTERED DURING DRILLING. CUTTINGS RETURN DIMINISHED DUE TO SATURATION.
Drilling Contractor:	WATER DEVELOPMENT CORP.		
Drilling Method:	AIR ROTARY CASING HAMMER		
Borehole Depth:	519		BOREHOLE DIAMETER IS 11 3/4 IN. TO 300 FT. AND 9 5/8 IN. TO TD.
Casing Depth:	502		

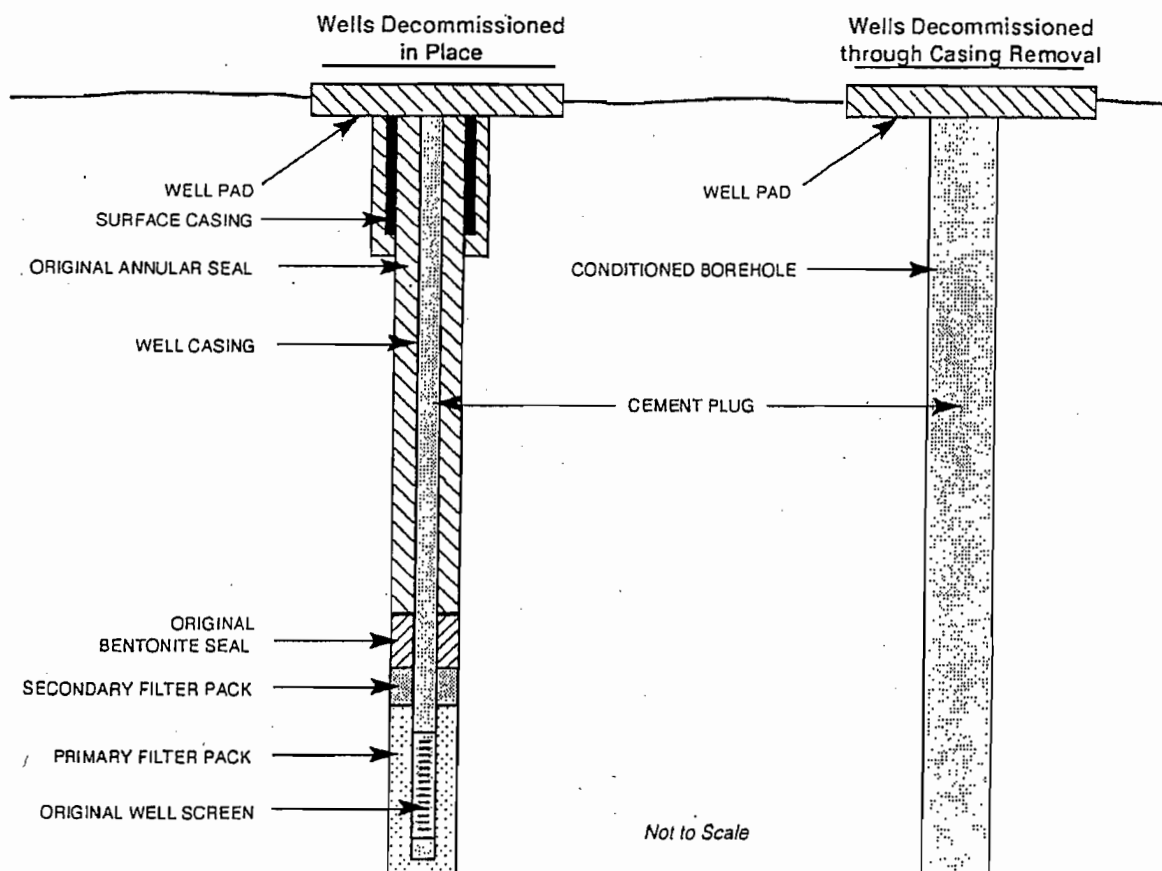


Interval	Start	Stop
PLUG BACK	510'	519'
VOLCLAY CHIP		

Additional Comments

ATTACHMENT E
Groundwater Well Abandonment Diagram for MWL-BW1

SNL/NM ER PROJECT
GROUNDWATER MONITORING WELL ABANDONMENT DIAGRAM



Well Name	MWL-BW1
Location	Mixed Waste Landfill
State Plane Coordinate X	411756.001
Y	1451698.73
Surface Casing Type	steel conductor casing
Surface Casing Length	20 feet
ID Well Casing	4.75 inches
Well Casing Depth	477.17 feet
Screen Interval	452.17 to 472.17 feet
Plugging Grout Type	Quick-Crete™ (bentonite grout)
Grout Volume Used	approximately 450 gallons
Date of Decommissioning	24-Jan-08

ATTACHMENT F
Well Development Forms for MWL-BW2

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: <u>Mixed Waste Landfill</u>	Project No.: <u>214</u>
Well I.D.: <u>MWL-BW2</u>	Date: <u>3/10/08 / 11 MAR 08</u>
Weather: <u>CLEAR, CALM, 50s-60s</u>	
Method: <u>Bailer</u> <input checked="" type="checkbox"/> Portable pump <input type="checkbox"/> Dedicated pump <input type="checkbox"/> Pump depth: _____	

PURGE MEASUREMENTS

Depth to Water (FT)	Time 24 hr	Vol. L/gls	Temp °C	ms/cm ³	ORP MV	pH	Flow L/gls	Turb NTU	DO %	Color and appearance
474.55	1543	40 G	20.25	0.637	180.2	6.84		191	51.0	4.60
475	0806	~45	19.64	0.636	142.8	7.30		71000	35.4	3.22
	0819	110	19.90	0.627	145.3	7.31		>1000	50.4	5.10
	0850	125	19.76	0.619	123.8	7.45		>1000	62.0	5.62
	0902	140	19.45	0.630	67.8	7.41		>1000	84.1	7.72
	0943	155	19.61	0.626	141.2	7.73		>1000	95.7	8.77
	1044	180	19.85	0.625	153.0	7.44		51.8	61.2	5.56
	1126	190	20.36	0.628	179.2	7.44		59.7	30.2	2.72
	1309	220	20.74	0.635	123.0	8.09		>1000	—	—
	1345	240	20.8	0.631	149.4	7.59		>1000	—	—
	1435	260	20.46	0.633	148.6	7.66		728	—	—
	1515	280	20.84	0.637	142.6	7.81		443	—	—
	1550	300	20.84	0.631	163.0	7.82		455	—	—
	1620	320	20.51	0.632	189.2	7.64		160	—	—
COC number	1656		20.27	0.628	211.5	7.56		316	—	—
Sample number(s):										

Purge Volume Calculations

⊗ sample after swabbing

Well Diameter

2" well: 0.16 gal/ft X _____ (height of water column) = _____ gallons
 4" well: 0.65 gal/ft X _____ (height of water column) = _____ gallons
 6" well: 1.47 gal/ft X _____ (height of water column) = _____ gallons

Tubing Diameter

1/4" OD: 2.4 ml/ft X _____ (length of tubing) = _____ millileters
 3/8" OD: 9.7 ml/ft X _____ (length of tubing) = _____ millileters
 1/2" OD: 21.6 ml/ft X _____ (length of tubing) = _____ millileters

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name: <u>MWL</u>	Project No.: <u>p²/4</u>
Well I.D.: <u>BW2</u>	Date: <u>3-13-08</u>
Weather: <u>Clear & Cold</u>	
Method: <input checked="" type="checkbox"/> Portable pump <input type="checkbox"/> Dedicated pump Pump depth: <u>497</u>	

PURGE MEASUREMENTS

Depth to Water (FT)	Time 24 hr	Vol. L/gls	Temp °C	Ec µmho	ORP MV	pH	Flow L gls	Turb NTU	DO %	Color and appearance
477.35	0802	10	15.47	693	304.1	6.80				
480.18	0820		15.47	693	304.1	6.80		0.94	20.7	2.02
480.97	0830	10	17.15	700	261.2	7.24		1.28	12.0	1.16
481.93	0846	15	17.89	696	231.1	7.22		4.91	13.5	1.27
482.58	0900	20	18.21	696	216.7	7.24		6.36	17.6	1.65
482.91	0916	25	18.37	700	209.2	7.22		4.18	16.5	1.54
483.08	0933	30	18.61	704	199.6	7.23		2.52	14.3	1.35
483.32	0952	35	18.72	705	192.0	7.19		1.53	13.3	1.23
483.51	1008	40	18.74	706	183.0	7.21		1.23	11.3	1.07
483.74	1025	45	18.54	705	178.1	7.20		1.00	10.3	0.97
483.94	1041	50	18.60	706	168.9	7.22		1.00	10.0	0.94
484.18	1057	55	18.71	705	163.5	7.21		0.78	9.8	0.91
483.73	1116	60	18.08	705	161.3	7.20		1.01	10.7	0.95
483.88	1138	65	18.12	705	157.4	7.23		0.78	8.7	0.79
COC number(s):										
Sample number(s):										

Purge Volume Calculations

Well Diameter

2" well: 0.16 gal/ft X _____ (height of water column) = _____ gallons
 4" well: 0.65 gal/ft X _____ (height of water column) = _____ gallons
 6" well: 1.47 gal/ft X _____ (height of water column) = _____ gallons

Tubing Diameter

1/4" OD: 2.4 ml/ft X _____ (length of tubing) = _____ milliliters
 3/8" OD: 9.7 ml/ft X _____ (length of tubing) = _____ milliliters
 1/2" OD: 21.6 ml/ft X _____ (length of tubing) = _____ milliliters

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

CONT.

Project Name:	Project No.: p 3/4
Well I.D.: MWL-BW2	Date: 3-13-08
Weather	
Method: _____ Portable pump _____ Dedicated pump Pump depth: 497'	

PURGE MEASUREMENTS

Depth to Water (FT)	Time 24 hr	Vol. L/gls	Temp °C	Ec µmho	ORP MV	pH	Flow L gls	Turb NTU	DO %	Color and appearance
484.08	1156	70	18.35	707	152.6	7.23		0.65	7.6	0.74
484.21	1213	75	18.37	706	150.0	7.20		0.68	7.2	0.68
484.31	1233	80	18.46	705	155.5	7.15		0.59	9.6	0.90
484.31	1249	85	18.46	705	149.5	7.14		0.62	8.9	0.83
485.42	1259	90	19.17	706	141.1	7.19		0.65	8.2	0.76
486.67	1309	95	19.48	707	138.4	7.13		0.61	7.5	0.69
488.10	1317	100	19.54	703	136.8	7.13		2.94	7.7	0.71
489.44	1327	105	19.44	702	138.9	7.12		8.36	9.2	0.84
488.52	1343	110	18.99	698	145.9	7.13		25.2	11.9	1.10
487.41	1401	115	19.10	703	122.3	7.15		6.25	14.6	1.35
485.95	1421	120	19.33	704	147.5	7.14		3.57	29.3	2.70
485.92	1436	125	19.36	705	174.7	7.17		2.89	35.5	3.25
485.71	1452	130	19.55	707	195.5	7.14		4.69	35.1	3.21
485.35	1509	135	19.78	708	205.2	7.14		2.69	35.7	3.19
COC number(s):										
Sample number(s):										

Purge Volume Calculations

Well Diameter

2" well: 0.16 gal/ft X _____ (height of water column) = _____ gallons
 4" well: 0.65 gal/ft X _____ (height of water column) = _____ gallons
 6" well: 1.47 gal/ft X _____ (height of water column) = _____ gallons

Tubing Diameter

1/4" OD: 2.4 ml/ft X _____ (length of tubing) = _____ milliliters
 3/8" OD: 9.7 ml/ft X _____ (length of tubing) = _____ milliliters
 1/2" OD: 21.6 ml/ft X _____ (length of tubing) = _____ milliliters

FIELD MEASUREMENT LOG FOR GROUNDWATER SAMPLE COLLECTION

Project Name:	Project No.:	P 4/4
Well I.D.: MWL-BW2	Date: 3-13-08	
Weather		
Method: <u>X</u> Portable pump _____ Dedicated pump		Pump depth:

PURGE MEASUREMENTS

[illegible]

Purge Volume Calculations

Well Diameter

2" well: 0.16 gal/ft X _____ (height of water column) = _____ gallons
 4" well: 0.65 gal/ft X _____ (height of water column) = _____ gallons
 6" well: 1.47 gal/ft X _____ (height of water column) = _____ gallons

Tubing Diameter

1/4" OD: 2.4 ml/ft X _____ (length of tubing) = _____ milliliters
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 1/2" OD: 21.6 ml/ft X _____ (length of tubing) = _____ milliliters